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JACK CHEESE

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Fig. 1. Weighing and Molding the Curd.

Jack Cheese, sometimes known as Monterey cheese, originated in Monterey County, California. The first Jack cheese was made on a ranch twenty miles south of Monterey about 1892. The method grew out of a need for disposing of surplus milk at a small expense for equipment. The fact that it requires but little equipment, makes it a practical method on farms where only a small amount of milk is available.

Until about 1912 very little was known of this cheese outside of Monterey County. Practically all the cheese which was not sold locally was marketed through San Francisco wholesalers. Previous to the war practically all this cheese which was manufactured consisted of full-cream or "table" Jack. Soon after the beginning of the war, however, the importation of grating cheese from Europe was cut off and in order to take care of the trade on these types of cheese on the

Pacific Coast, San Francisco wholesalers conceived the idea of replacing it with Jack cheese. Cheese makers were given instructions to make the Jack from half-skim milk and to ship it as soon as practicable (about one week old). The cheese was then dried and cured by the wholesaler.

The grating cheese when properly made and cured proved to be a fair substitute for the imported brands and soon became popular on the Pacific Coast. Eastern buyers, learning of this cheese, made inquiry and asked for trial shipments and the result was that large orders were placed with San Francisco distributers. Until this time practically all the Jack cheese had been made by men experienced in the manufacture of this type of cheese and a good product was being used to fill eastern orders. This large demand, however, was more than could be supplied by the factories manufacturing Jack cheese and a call was sent out to the dairies and creameries to turn their raw product into Jack cheese, offering, at the same time, very attractive quotations. The result of this was disastrous to California Grating Jack cheese. Jack cheese factories sprang up in all parts of the state and many creameries made Jack cheese as a side line. A large portion of the new cheese was made from straight skim milk and naturally was lacking in quality. The market soon became over-supplied with an inferior and non-uniform product and the failure of the distributers to fill their orders with a high-quality cheese soon destroyed the buyers' faith in Jack cheese.

A good quality of grating Jack cheese can be made and a trade built up if a uniformly high standard is maintained. This circular has been prepared with the thought of aiding in the development of this branch of the cheese industry and to answer the many inquiries which are coming to the university relative to both full-cream and grating Jack cheese.

MILK FOR JACK CHEESE

Too much care can not be given to the handling of milk to be used for making Jack cheese. The method employed for making the cheese gives little opportunity for a lactic starter to overcome undesirable bacteria and consequently a very high grade of milk is desirable. As a rule, the cheese is made once a day from a mixture of night's and morning's milk which makes it necessary to exercise care in the handling of the night's milk.

On account of the mild climate in California many dairymen leave the cows in the open corral while milking during the greater part of

the year. This practice is especially true on dairy farms producing milk used for cheese making. As a result the milk is often badly contaminated with fine manure dust which is agitated by the cows moving about and by the wind. Manurial contamination will invariably cause gassy milk and as a rule a bitter, gassy cheese. In order to avoid such contamination the cows should be housed in a clean barn when milked. The udder and flanks of the cows should be washed, or cleaned with a damp cloth before milking. This removes a great deal of manure and dirt some of which might otherwise fall into the pail. Since there is always more or less dust in the stable air and dust falling from the cow's body, some of this foreign material will naturally fall into the pail. This contamination can be lessened, however, by the use of small-top milk pails.

Any utensils which come in contact with the milk should be thoroughly sterilized before using. Recent experiments[1] have shown that a very large percentage of the bacterial contamination of milk comes from the utensils. Utensils may be sterilized by placing them in boiling water or by exposing them to live steam.[2]

As soon as the milk has been drawn it should be taken to the milk house (which, according to the California Dairy Laws, must be separate from the barn), and poured over a cooler. The practice of pouring the milk into cans which are placed in the barn behind the cows should be eliminated, since this increases the contamination of the milk and exposes the milk to foul odors for a long period.

COOLING THE MILK

In cases where the dairy is provided with a clean well-sealed milk house the aerator cooler, which cools the milk immediately, gives best results. This kind of a cooler should not, however, be used in places where there is likely to be dust in the air or foul odors. Where a good milk house is not provided for handling milk, the best method for cooling is to set the cans in cold water immediately after the milk has been drawn. The tank in which the cans are placed should be of sufficient depth for the water to reach the necks of the cans. A stream of cold water should be kept running into the tank and the cans agitated every ten minutes until the milk has been cooled to within a few degrees of the temperature of the water. The over-flow water can be used for watering stock or for irrigation purposes. In order

1 Bul. No. 642, U.S. Dept. Agr. Bur. An. Ind, "The Four Essential Factors in the Production of Milk of Low Bacterial Count."

2 Circ. No. 179, Cal. Agr. Exp. Sta. "Factors of Importance in Producing Milk of Low Bacterial Count."

to allow the milk to be agitated and mixed from time to time, which hastens the rate of cooling, the can should not be completely filled before the milk has been cooled. Milk stirrers are not advisable for mixing the milk unless they are thoroughly sterilized before being used. After the milk has been cooled to a low temperature with water, it can be further cooled during cold nights by placing the cans in the open air. Even better results can be secured by placing wet sacks around the cans when placed in the open air. The milk should always be cooled to as low a temperature as possible with cold water first, however, since water is a better conductor of heat than air and will cool the milk more quickly. On farms where cheese is made and the milk is poured into the cheese vat for cooling, cold water should be turned into the vat jacket and allowed to run continuously until all the milk has been cooled to the temperature of the water. The milk should be stirred every ten or fifteen minutes in order to hasten the cooling. The morning's milk should also be cooled, except where the cheese is made on the ranch and the milk made into cheese immediately after it is all drawn.

MILK FOR JACK CHEESE

The Method

The cheese is usually made every morning from night's and morning's mixed milk but better results can be reached during the warm weather by making it twice daily. Good milk for Jack cheese will not test over 0.16% acidity, although milk testing higher can be used. Milk testing about 3.5% fat will make a cheese with good firm body and will be well within the cheese fat-standard set by the California laws. Milk testing from 4 to 5% fat will usually make a cheese too soft for shipping. Such milk can be standardized by adding fresh skim milk or removing a part of the fat. The amount of skim milk to be added or the amount of fat to be removed should be calculated and not done by guess work.

PREPARING AND USING A STARTER

A starter is sour (clabbered) milk and is used to overcome undesirable bacteria and to develop acid. It is very desirable that good starters be used because a starter containing undesirable bacteria will injure the quality of the milk. Commercial lactic-acid starters, which are prepared in special laboratories and are supposed to be pure cultures of lactic acid bacteria, should be purchased. These can be obtained through the dairy supply houses or direct from the laboratories.

Fill a pint or quart bottle three-quarters full of good skim milk, tie

a parchment paper cover over it and heat in a water bath to 180° F, holding it at that temperature for 30 minutes. Cool to 75° F, being careful not to lower the temperature too quickly at first, in order to avoid breaking the bottle. Empty the contents of the small culture which has been purchased into the pasteurized skim milk, and hold at 70 to 75° F until curdled. (This is called the mother culture.) If you are not ready to use the curdled milk, set it in a cool place until used. The second day prepare another bottle of skim milk in the same manner as the first and after pouring off one-half inch of the top from the curdled milk add about a tablespoonful of it to the newly pasteurized milk. If a pint bottle of culture is carried use only one-half tablespoonful for inoculating. Hold at 70 to 75° F until curdled, as on the previous day. This should be transferred on three successive days before it is ready to use. Great care should be exercised in carrying the cultures in order to prevent contamination. Anything which comes in contact with the milk should first be sterilized and in transferring the cultures they should not be exposed to the air longer than necessary.

On the fourth day an amount of milk sufficient in quantity to be used as a starter in the cheese milk should be pasteurized in the same manner as the bottled milk. In a large factory a special starter can should be purchased for growing the "bulk" starter. Where a comparatively small amount of milk is made into cheese, a homemade starter container can easily be made. A milk can may be used for the starter and in case steam is available a barrel may be used for the water bath. The top of the barrel should be cut off and a drain hole bored in the side near the bottom; also an overflow hole just below the top of the milk can. The barrel should be piped with both cold water and steam. In case steam is not available, a metal container must be used for the water bath so that it can be heated on a stove.

After the can of milk is properly pasteurized and cooled and the mother culture for the next day inoculated, transfer some (about 2% of the bulk starter) of the mother culture from the previous day to the can of pasteurized milk. After thorough mixing, it should be allowed to stand in the water bath at 70 to 75° F until curdled. It is then ready for use in the cheese milk. The mother starter should be carried daily as well as the "bulk," because it is easier to prevent contamination in a small container than in a large one. Always inoculate the "bulk" culture from the "mother" starter. A good starter will have a clean acid flavor, be free from gas holes or separated whey, test about 0.7 to 0.9% acidity, and become smooth like heavy cream when thoroughly agitated.

Add about ½ to 1% starter through a strainer into the milk and raise the temperature of the milk to 86° F.

ADDING THE RENNET

A sufficient amount of rennet to curdle the milk ready for cutting in twenty-five minutes should be added to the milk. The rate at which rennet is used will depend upon the acidity of the milk and the strength of the rennet extract. According to the strength of present commercial extracts, 6 to 8 ounces per thousand pounds of milk will be required. The rennet should be measured in a glass graduate and diluted about 20 times its volume with cold water. It is then added to the milk and thoroughly mixed for three minutes. The milk should then be quieted by pushing a pail slowly into the milk in the center of the vat. When the milk seems still, remove the pail slowly and cover the vat with a cloth. In order to get a perfect coagulation the milk should be still when it curdles.

CUTTING THE CURD

The curd is tested for firmness by inserting the index finger diagonally and raising it slowly, breaking the curd. If the finger splits the curd, without mashing it and leaving particles on the finger, it is ready to be cut. First cut the curd lengthwise of the vat with the horizontal curd knife, then lengthwise and crosswise with the vertical knife. Allow the curd to stand about three minutes before distributing it, then begin to remove the curd which sticks to the sides and bottom of the vat. Stir very gently and start to heat ten minutes after cutting. Thirty-five minutes should be allowed for raising the temperature to about 108 to 110° F. If the heat is applied rapidly the curd will become pulpy and will not firm properly. During the cooking process the curd should be stirred sufficiently to keep the cubes from sticking together. This will require almost constant agitation at first but after the temperature has been raised to the maximum, less stirring is necessary. The time required for cooking will depend upon the condition of the milk, but it usually takes from 1¼ to 2 hours.

DIPPING

(Removing the Whey)

The time of dipping is dependent upon the firmness of the curd. There are no tests which will enable one to determine this point accurately, and one must rely wholly upon judgment. The curd is properly firmed when it becomes slightly rubbery and springs apart

when pressed between the hands. The time of dipping will also be influenced by the time required for the whey to run from the vat. In case of a large vat where it takes fifteen to twenty minutes for the whey to run out, it will be necessary to start removing the whey sooner. After the excess whey is removed the curd should be stirred to prevent it from matting together. The stirring should be done *carefully, however, as rough handling at this time will injure the cheese and cause an excessive loss of fat.*

SALTING

About twenty to thirty minutes after the whey has been removed salt may be added. Salt is thoroughly mixed with the curd at the rate of 3 to 3½ pounds per 1000 pounds of milk. Allow the salt to dissolve completely before molding the cheese.

MOLDING

This cheese is not molded in metal hoops, as are most of the hard types of cheese, but is pressed in cloth. The press cloths used for molding are made of heavy sheeting and should be about 34 inches square. The cloths should first be cleaned and boiled. They are then laid out evenly, one over the other, and spread over the top of a large open pail. Push the center down to the bottom of the pail, leaving the edges hanging over the sides. Sufficient curd (about 7 pounds) to make a six-pound cheese is weighed out and poured into the top press cloth. The four corners of the press cloth are caught up with the left hand while with the right hand the curd is formed round and the cloth straightened. The cloth is then taken up tightly over the curd with the left hand and the cheese is given a rolling motion on a table, pressing at the same time, with the right hand to expel the whey. This twists the press cloth tightly over the curd where it is tied with a cloth string. The excess cloth is spread out evenly over the top of the cheese and this is then ready for the press.

PRESSING

The cheese are pressed between wooden planks, 1½″ x 12″ surfaced; the length will depend upon the number of cheese pressed or the size of the room. The base should be slanted slightly to permit the whey to drain off rapidly. The cheese are placed in the center of the board about one inch apart, after which another board is placed on top. If necessary, the cheese can be placed four or five layers high if boards are placed between the layers. Best results can be secured by placing the boards and cheese in an ordinary upright cheese press.

Another method is to brace the first board near a wall about three feet from the floor; then level with the top board a lever (2 x 4, 5 feet long) is fastened to the wall with a hinge, which will allow it to be raised or lowered. These levers, one every four feet, are laid over the top board and weights (about 100 pounds each) are fastened to the outer end; this acts as an automatic press.

Fig. 2. A Jack-Cheese Factory showing the system for cooling milk; also cheese being removed from an upright press.

The cheese are left in the press about twenty hours, after which the press cloths are taken off and the cheese laid on shelves. If the press cloth sticks to the cheese, pulling out pieces of cheese, this is an indication that the surface got too dry while in the press. Water thrown on the cheese occasionally, or the room kept moist, will help to prevent this. Sticking may also be caused by dirty press cloths.

CURING

The curing room should be well ventilated and cool. A desirable temperature for curing Jack cheese is 60 to 65° F. The cheese should be turned daily and the shelves kept clean and dry. The shelves should be laid loosely on arms so that they may be turned over every few days. In from three to six days after the cheese are taken from the press, they should be dipped in hot (200° to 220° F) paraffin for

15 seconds. This will prevent shrinkage and cracking and give the cheese a neat appearance.

The time required for curing will depend upon the condition of the cheese and the curing temperature. It usually requires from three to five weeks before the cheese are sufficiently cured for marketing.

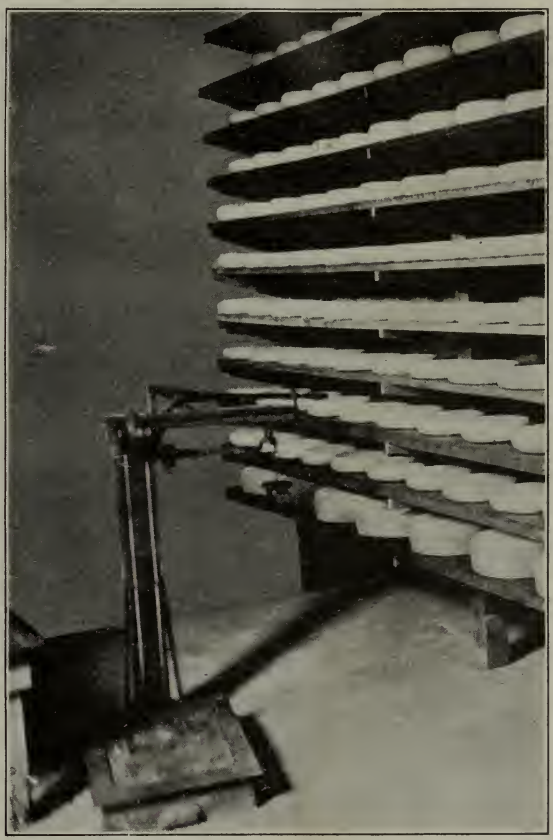

Fig. 3. Jack Cheese on the Curing Room Shelves.

HALF-SKIM (GRATING) JACK CHEESE

For half-skim Jack cheese the night milk should be skimmed and the skim milk mixed with the morning whole milk. The method for making the half-skim is the same, except for the following: Set at 90° F with one-fourth less rennet extract. Cook at 104 to 106° F.

After the cheese have been pressed they should be placed in a saturated salt brine solution and kept there about five to seven days. They are then laid on the shelves and turned daily for one week. At

the end of this period the cheese are greased with a coating of linseed, cottonseed or some similar oil. The cheese will not be ready to grate until they are five months old; they will be better if held ten to twelve months.

STEPS IN THE PROCESS

(Full Cream)

1. Take acid test of milk (should not be over 0.18%).
2. Take sample of milk for fat test.
3. Add ½ to 1 per cent starter through strainer.
4. Heat milk to 86° F.
5. Measure rennet, 6 to 8 ounces per 1000 pounds of milk, dilute it with 20 times its volume of cold water and add to milk. Stir 3 minutes and still milk.
6. Cut curd when properly curdled. Use horizontal knife lengthwise, then vertical knife lengthwise and crosswise.
7. Three minutes after cutting begin to stir curd. Ten minutes after cutting start to heat, raising temperature to 108 to 110° F in 35 minutes.
8. Keep curd stirred sufficiently to prevent matting from cutting to dipping.
9. Remove whey when curd is firmed. Keep curd from matting after whey is off. (*Too much stirring would injure curd.*)
10. Add salt at rate of 3 to 3½ pounds per 1000 pounds of milk.
11. Sterilize press cloths and arrange them in pail. Weigh curd into press cloths and mold.
12. Place cheese in press.
13. Take cheese from press next day, remove press cloths and place on shelves.
14. Three to six days after pressing dip cheese in paraffin at 200 to 220° F for 15 seconds.

For *Half-Skim* (*Grating*) *Jack Cheese* substitute the following for the corresponding numbers in the above directions.

4. Heat milk to 90° F.
7. Three minutes after cutting begin to stir curd. Ten minutes after cutting start to heat, raising temperature to 104–106° F in 35 minutes.
13. Take cheese from press the next day, remove press cloths and place cheese in a saturated salt brine solution for 5 to 7 days.
14. Take cheese from brine and lay on shelves for one week.
15. Rub the cheese with oil.

SUMMARY

The production of Jack cheese is practicable on farms because it requires a comparatively small investment for equipment.

Grating Jack cheese, when properly made, is a good substitute for imported grating cheese.

A good grade of milk is necessary for Jack cheese making, but any dairyman taking proper precautions can insure a milk supply suitable for this purpose.

The different steps in the process consist of adding "starter" to the milk, mixing the rennet with the milk, cutting the curd, cooking, draining off the whey, salting, molding and pressing the curd.

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